Economic Impact of Off Road Cycling in Duluth: An Expenditures Approach

April 2017

Abby Savolt, Professor McIntosh
Labovitz School of Business and Economics
University of Minnesota Duluth
Duluth, MN

Table of Contents

Table of Figures

I. Introduction

In 2014, Duluth was voted *Outside* magazine's best outdoor town (Helal, 2014). With all the various outdoor recreational opportunities from hiking to skiing, it's no wonder that Duluth is an ideal home for outdoor enthusiasts. However, being well known for outdoor recreation has not stopped Duluth from continually trying to improve the opportunities for both tourists and citizens. Since 2010 Duluth has been working hard to develop itself as a prime mountain biking destination.

The City of Duluth and Cyclists of Gitchee Gumee Shores (COGGS), the local mountain biking club, joined together with the vision to create the first 100+ mile system of single-track mountain biking trails within an urban environment ("Duluth Traverse Mini Master Plan", 2017). These trails would provide access to all residence of Duluth within a short distance of their home. Additionally, the trails would be built sustainably as to not create erosion into the natural waterways and be built to handle recreational use without degrading. In order to do so, Duluth needed to add roughly 70 miles to the existing trail systems. The total estimated cost of the project is between $6.126 million and $6.986 million, and as of 2017 it is 85% complete ("Duluth Traverse Mini Master Plan", 2017).

The dream became a reality when Duluth received the State Legacy Grant in 2011, providing $250,000 in funding to begin trail construction. Following the receipt of this first grant, Duluth continued to receive other funding from additional grants such as the Federal Recreational Trails Grant Program and the Minnesota DNR Regional Trail Grant Program. Even more additional funding has come from private donations, fundraising events, and the ½ and ½ Tourism Tax in Duluth ("Duluth Traverse Mini Master Plan", 2017). The ½ and ½ Tourism Tax is a special sales tax at tourist related industries such as restaurants, bars, hotels and motels used to fund recreational areas heavily used by tourists as well as other tourist related city expenses (Passi, 2015). A lot of time, money and effort have been invested into the construction of the trails, but what is the return on this investment?

The core objectives of this study are to quantify the extent and satisfaction levels of trail use and estimates of market based benefits of the Duluth mountain biking trails. The results of a survey shed light on the demographics of trail users, user biking preferences, how often mountain bikers ride, and satisfaction levels of the Duluth mountain biking trails. Further analysis breaks down the trail users as local or nonlocal to estimate total expenditure amounts from each.

II. Literature Review

Studying the economic impact of mountain biking is still a relatively new area of research with a limited number of studies that have been conducted. However, across all results of the studies it is evident that mountain biking has an economic impact on the area being researched. The studies conducted survey mountain bikers in the specified area by asking questions related to trail user demographics and their expenditures related to items such as bicycles, repairs and maintenance, lodging, groceries, etc.

By asking questions related to trail user demographics, researchers can get a better understanding of who generally participates in the sport. This can be important information to mountain biking advocates, because by understanding the users demographics they can better tailor trails and amenities to best meet user needs and interests. After analyzing the results of mountain biker trail user demographics across various studies results suggest that mountain bikers tend to be males between the ages of 25 and 54, with household income in excess of $100,000 a year. (Lau, 2014; McNamee, Jeff, Katie Mail, and Kadin Hashimato, 2013; Boozer, Benjamin & Mike Self, 2012; "2014 WMBC Rider Survey*";* Western Canada Mountain Bike Tourism, 2007*)*

On of the earlier mountain biking economic impact studies was in Moab, Utah in 1996. This study used the travel cost method and surveyed 310 riders at trail heads between March 9th and March 16th. The results are given as the consumer surplus, which can be defined as the area above the actual market price of a given good and below the price a trail user is willing to spend for that given good. ("Consumer Surplus", 2017) The individual per-trip consumer surplus ranged from $197 to $205, for a total annual consumer surplus at the slick rock trail of $8,422,800 to $8,770,300. This study was limited due to the time period that it was conducted. Researchers used one week of samples to conclude the total annual economic impact.

A second study was conducted in the Sea to Sky Corridor in British Columbia. While the Moab, Utah study used the Travel Cost Method; this study used a survey method that measured trail users expenditures. Compared to the Moab, Utah study that only collected data over a one-week period, this study collected surveys over a three and a half month period, giving a more accurate sample of data used to conclude the impact. Between June 4th and September 17th, 2006 306 surveys were collected from trail users at four popular trailheads across three communities, in the Whistler Bike Park, and during two bike races. The results concluded that the total visitor spending in Whistler related to mountain biking was approximately $34.8 million over the time period that the survey was conducted. One way to make this study stronger would be to report the conclusions on an annual basis, like what was done in the Moab, Utah study (Western Canada Mountain Bike Tourism, 2007).

III. Method

Survey

The primary method used for this study was surveys administered to Duluth mountain bike trail users. Several drafts of the survey were created and edited before coming up with the final survey. Drafts were reviewed by a handful of sample trail users to verify that questions were easy to understand and did not take too long to complete. Next the principle investigator verified that all the questions asked would be able to be combined to reach the intended results.

Once the final survey was created, it needed to receive Institutional Review Board (IRB) approval for human subject research prior to being available online. This approval process required the researcher to obtain human subjects training. This training was received through the Collaborative Institutional Training Initiative (CITI), where the

researcher took one course on Social and Behavioral Responsible Conduct of Research and another on Human Research. The researcher was required to pass tests for each course segment.

The written application was a 12-page document describing the participant population, the location of subjects during research data collection, the recruitment and compensation process, how confidentiality requirements would be met, the consent process, and verifying that there were no conflicts of interests.

The application was submitted on November 26th, 2016 with the final survey, a consent form, and a description of the postings that would be posted on Facebook as well as the emails that would be sent out. The researcher collaborated with the IRB analyst to meet IRB standards between November 26th and January 11th, 2017, when approval was finally granted by the Institutional Review Board at the University of Minnesota as being exempt from full committee review

Once the survey was approved it was entered into the online software called Qualtrics. There were two versions of the survey, one for "Locals", defined as those trail users who are from Duluth, Superior, Cloquet and Hermantown. The other version was for "Nonlocals", which included everyone not from one of the 4 cities listed above. The survey was programmed into Qualtrics, and depending on the participant's zip code, they would either be shown the "local" or the "nonlocal" portion of the survey. See page 23 for the complete survey.

The survey was officially published and made available to Duluth mountain bike trail users on January 18, 2017. Survey participants were notified of the survey via social media and email. The survey was posted on the principal investigators Facebook page, as well as the following Facebook groups: Minnesota Off – Road Cyclists (MORC), Duluth / Superior biking community, Lake County Mountain Bike Trails, Twin Cities / MN Bicycle Advice and Discussion, Cyclists of Gitchee Gumee Shores – COGGS, and UMD Cycling Club. The survey was open for 9.5 weeks before closing on March 26th.

IMPLAN

Once the survey was closed, the final quantitative results for nonlocal trail users were imputed into IMPLAN. The IMPLAN system, Impact for Planning, is an input-output economic impact modeling system that is useful tool when conducting economic impact research ("IMPLAN Methodology - Research on the Economic Impact of Cooperatives*"*). It can be used to measure the direct, indirect and induced impacts. The direct impact is the initial change to the economy that is being examined, which is the impact concluded from the survey results.

Indirect effects are defined as the changes that are a result of inter-industry changes in purchasing from the supplying industries, based on the changes in demand of the principle industry affected ("IMPLAN Methodology - Research on the Economic Impact of Cooperatives*"*). For example, mountain bikers eating and buying food from a restaurant would be considered a direct effect measured by the survey, while the indirect

effect would be the increased demand of the raw food materials purchased by the restaurant from suppliers. The increased demand not only economically impacts the restaurant, but also indirectly impacts the restaurants suppliers. The induced effects are the changes in local spending that result from income changes. To continue with the restaurant example, the induced effects would come from the restaurant workers who earn wages and tips from mountain bikers visiting their restaurants, and then spend this money in the city. By using IMPLAN and incorporating not only the direct effects, but also the indirect and induced effects of mountain biking, researchers can get a better understanding of the impact mountain biking has on the larger economy, as well as take out any impacts that do not have an impact on the area in question ("IMPLAN Methodology - Research on the Economic Impact of Cooperatives").

The nonlocal expenditures were run through the IMPLAN model to estimate the multiplier effects of nonlocal mountain bikers in Duluth. IMPLAN uses county specific data. For the purpose of this study St. Louis County was used, based on data from 2015, and the results are reflected in terms of 2016 dollars. IMPLAN contains data from federal data sources such as the US Bureau of Economic Analysis, US Bureau of Labor Statistics, US Census Bureau, and US Department of Agriculture Census. For more extensive detail about IMPLAN data please visit the IMPLAN website containing information about U.S. data methods and sources, the link is included in the Works Cited ("U.S. Data Methods and Sources", 2015).

Limitations

One limitation of this study is the difference between the population defined as nonlocal for survey respondents and the study area being used through IMPLAN. As mentioned earlier, the survey results define nonlocals as those who responded that their zip codes were outside of Duluth, Superior, Cloquet and Hermantown. However, IMPLAN is based on data from counties, and for the purpose of this study St. Louis County was used. For more accurate results riders should have been asked what county they are from.

This study is also limited in accurately providing an exact population of mountain bikers in Duluth to base the study results off of. Based on the circumstances that, to date, no trail counts have been conducted in Duluth, estimates where predicted for the purpose of this study. A lot of factors went into this population estimate including trail counts done in Cuyuna, MN, Duluth's distance from the Twin Cities, a study conducted in Oakridge Oregon, and Duluth's popular tourist industry.

Population Prediction

First, we look at Cuyuna, MN another popular mountain biking destination. In 2011, IMBA designated Cuyuna as a Bronze Level Ride Center. Through trail counts, Cuyuna saw an increase in mountain biker traffic from 15,552 in 2011 to 22,503 in 2012 ("2014 Cuyuna Cyclist Survey", n.d). A similar economic impact study was conducted in Cuyuna where they estimated, with additional investments in their mountain bike amenities and facilities; they would attract 45,000 visitors every year ("2014 Cuyuna

Cyclist Survey", n.d). Cuyuna is located 130 miles from the Twin Cities, a major metropolitan hub with a population of 3.4 million based on the 2010 Census. In comparison, Duluth is located a similar distance from the Twin Cities at approximately 150 miles. However, in 2016 IMBA awarded the Duluth Traverse a Gold-Level Ride Center, making Duluth only one of six Gold-Level Ride Centers in the world ("Duluth Traverse Mini Master Plan", 2017). Due to the fact that Duluth is a Gold-Level Ride Center the assumption was made that this would attract more riders to the area.

Next, we look at a study conducted in 2014 in Oakridge, Oregon. Between 10,700 and 15,900 trips are estimated to visit Oakridge, Oregon every year for the mountain biking. This is the number of trips, not the number of people. Some people could make multiple trips to the area every year making the population lower. Oakridge, Oregon located 150 miles from Portland, Oregon, which is a similar distance from Duluth to the Twin Cities, and has a similar population to the Twin Cities at a population of 2.4 million. In addition Oakridge was designated as a silver-level Ride Center in 2011 by IMBA, but was upgraded to gold status in 2015, which was after this study was conducted ("Oakridge (OR) Gold-level | International Mountain Bicycling Association", n.d).

Based on these factors the population of mountain bikers was predicted to have a conservative middle and high bound of 45,000 to 60,000. 25% of this population was predicted to be local and 75% nonlocal.

IV. Results

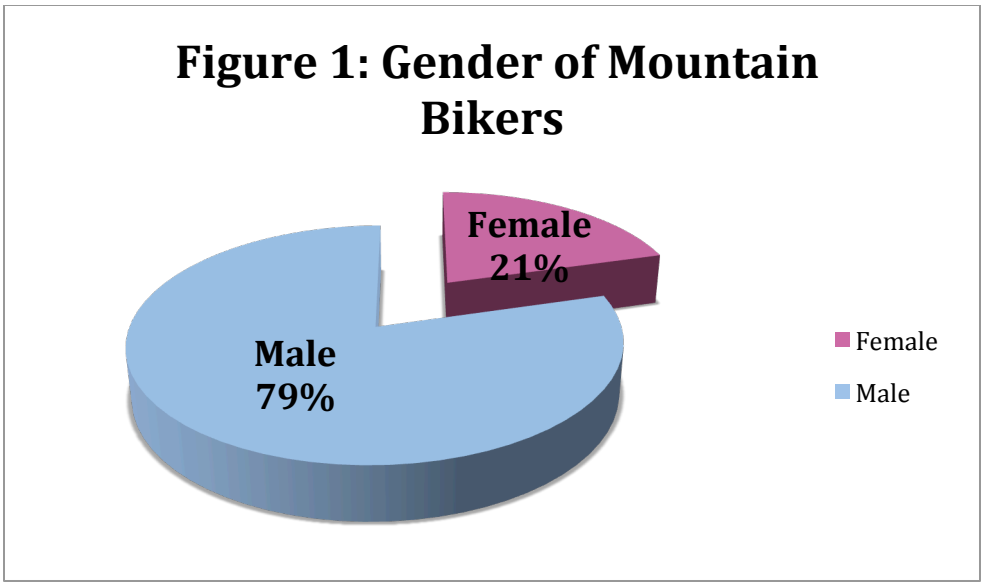
Trail User Demographics

It is important to examine the demographics of mountain bikers to understand who is participating in the sport in Duluth. By analyzing the demographics, mountain biking destinations can better tailor trails and amenities to best meet users needs.

A total of 384 mountain bikers took the survey in the 9-week period.
One person responded no to the consent form and 7 were under 18. That left us with 376 total respondents, 135 of which were nonlocals and 241 of which were locals.

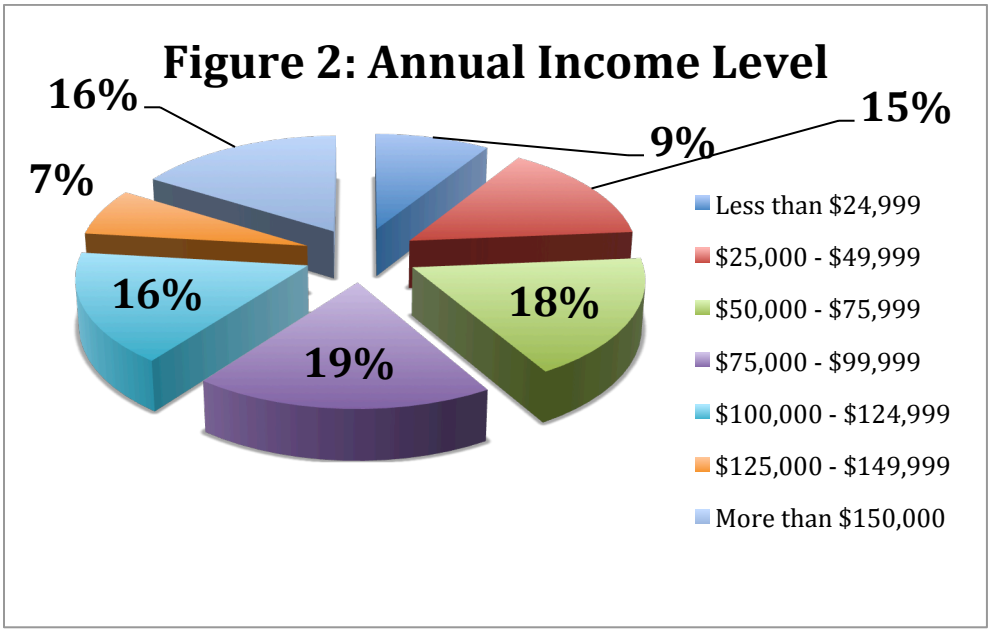
Gender

Of the 376 respondents, 20% were female and 79% were male. This is consistent with other economic impact studies conducted in other parts of the world. A summary of three different studies conducted in Whistler, Canada, Washington, and at races across Oregon concludes that 18-29% of mountain bikers are female, while 71-82% are male (Western Canada Mountain Bike Tourism Association, 2007; "2014 WMBC Rider Survey"; McNamee, Jeff, Katie Mail, and Kadin Hashimato, 2013.)



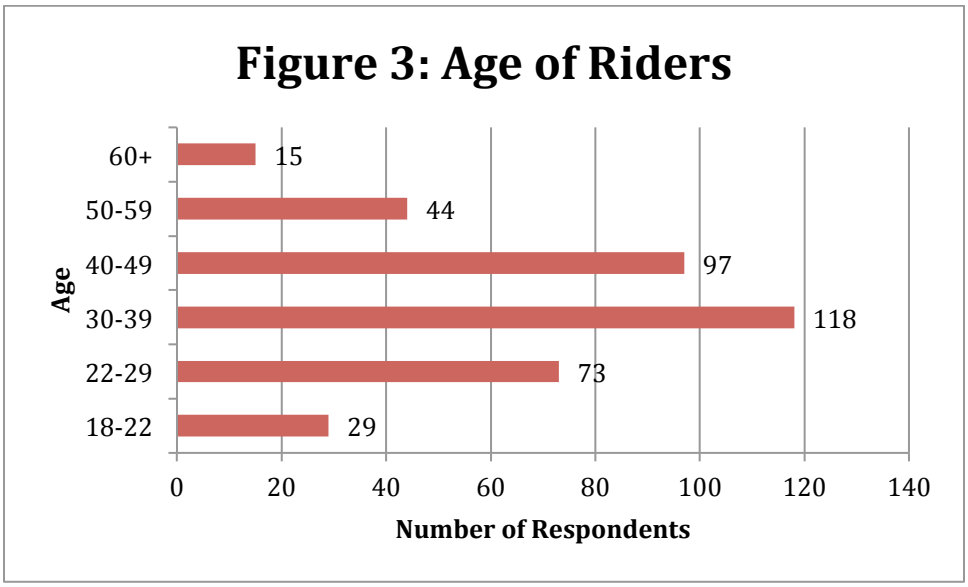
Annual Income

Income level of mountain bike trail users varied greatly across those riders that were surveyed as can be seen in Figure 2. There is no one-income range that stands out significantly from the others. These results specific to Duluth are different than results from other similar studies conducted. The results of 5 other studies conclude that annual household income was greater than $100,000 for the majority of the riders. This majority ranged from anywhere between 38.45% of the population surveyed to 72% falling in the $100,000 plus income level (Lau. 2014; McNamee, et. all 2014; "2014 WMBC Rider Survey"*;* Boozer, et. all, 2012).



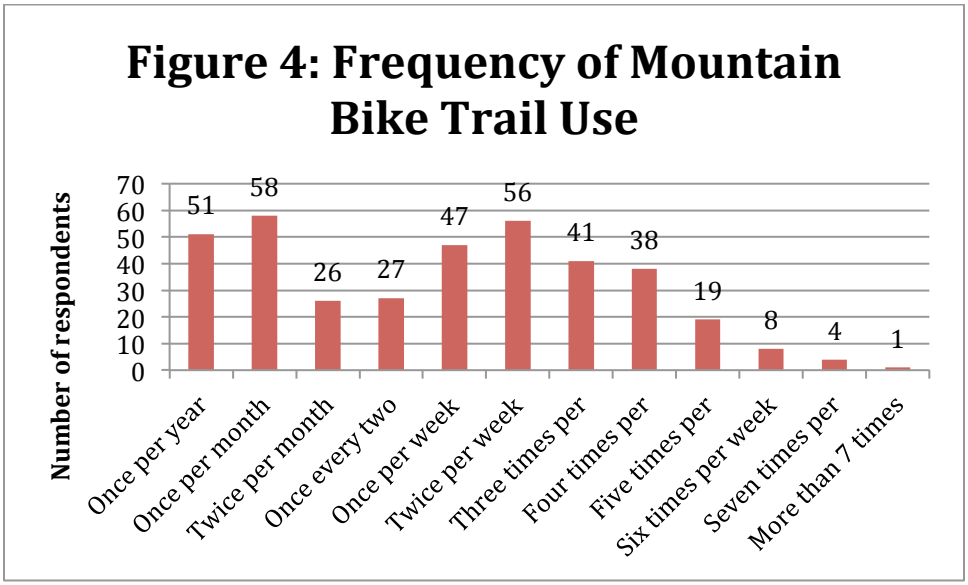
Age

A majority of riders (31%) responded that they are between the ages of 30 and 39, followed by 26% responding that they are between 40 and 49 years. A summary of these results are shown in Figure 3.

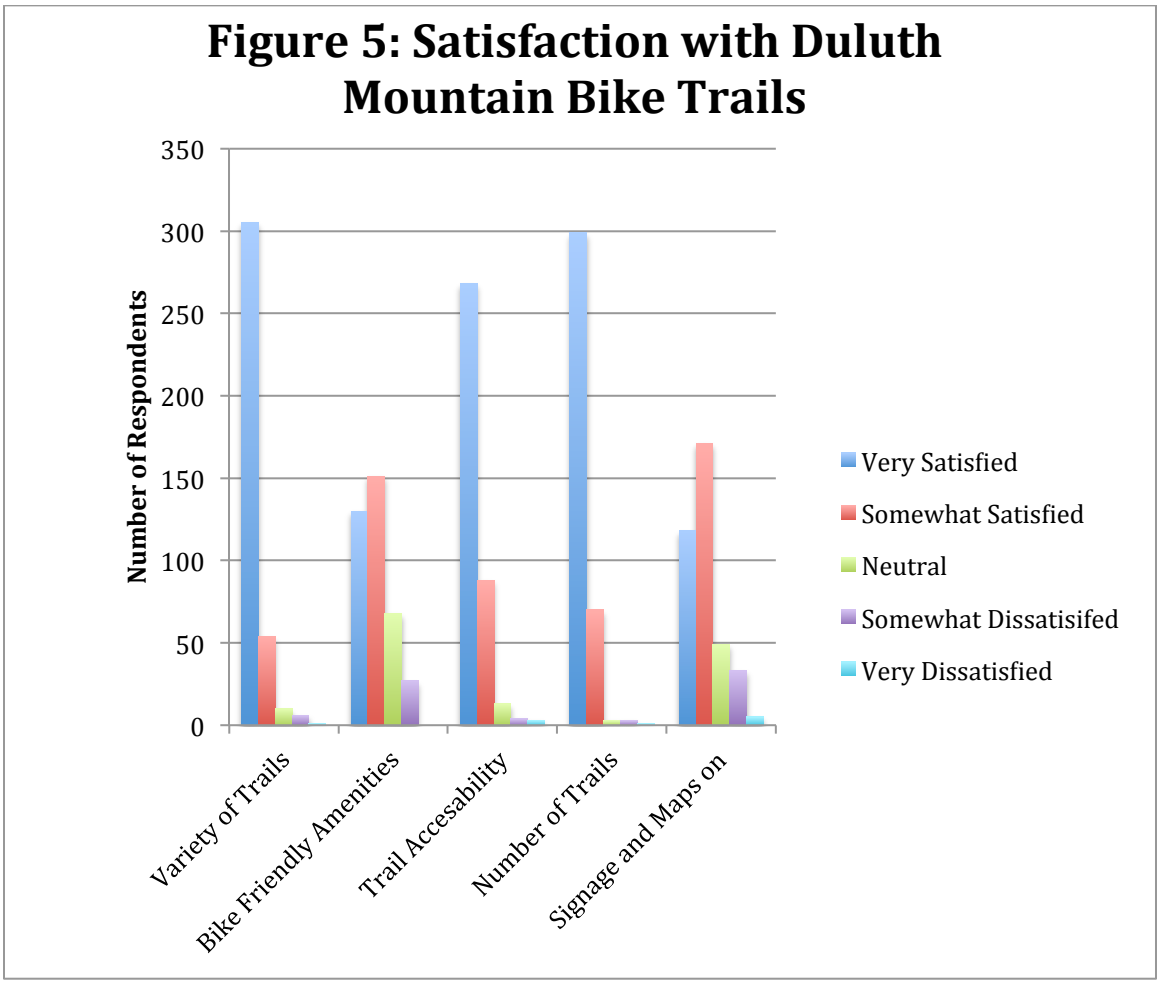


Frequency of Trail Use

57% of respondents replied that they ride the Duluth mountain bike trails at least once per week. This could imply that more mountain biking enthusiasts than casual mountain bikers took the survey. The results are summarized in Figure 4.



Satisfaction with Various Aspects of Duluth Mountain Bike Trails
Finally, Figure 5 shows respondents satisfaction with various aspects of Duluth mountain bike trails. A majority of the respondents are very satisfied when it comes to the variety of trails, trail accessibility, and the number of trails in Duluth. When it comes to bike friendly amenities and signage and maps on trails the majority of respondents are somewhat satisfied. These results show that riders are overall satisfied with the various aspects of Duluth mountain bike trails.



Local Results
As mentioned earlier, the local sample size consisted of 241 respondents. These 241 respondents spent a total of $560,945 on mountain bike related expenditures, averaging a total yearly expenditure of $964.84 per person. The population of local mountain bikers in Duluth was estimated to be 25% of the total mountain biking population providing a low population estimate of 11,250 riders and high population estimate of 15,000 riders. Based on these results it is estimated that local mountain bikers directly spend $10.9 million to $14.5 million on mountain bike related items every year. The results are broken down by category in Figure 6.

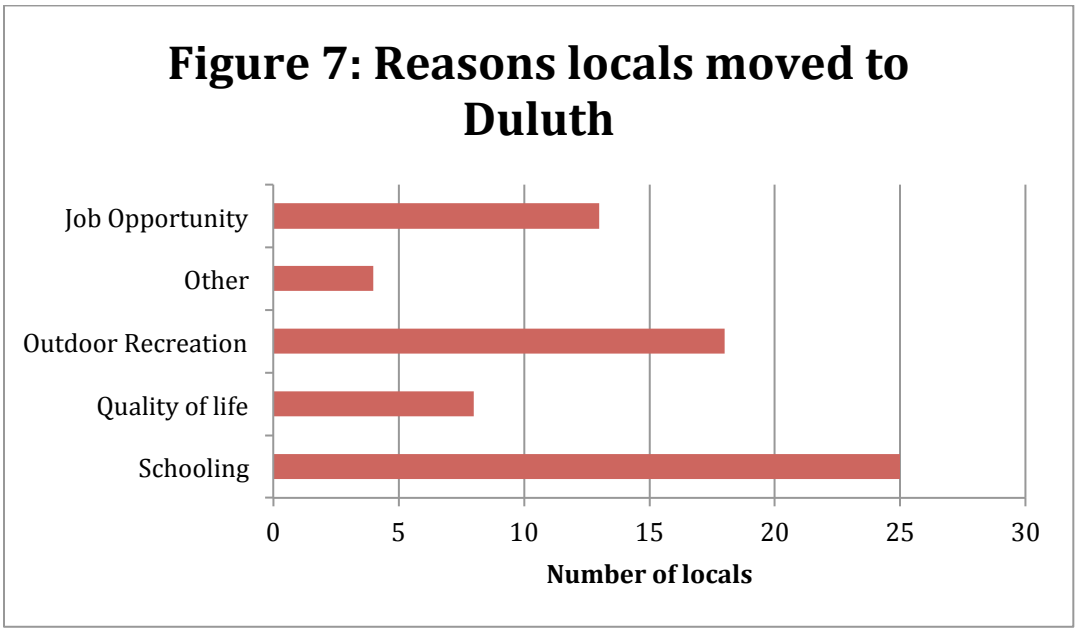
It should be noted that the amount shown for total expenditures on bikes for those surveyed, in Figure 6, was divided by 10. This is based on the fact that the bicycle industry recognizes that the average person purchases a new bike every ten years, as was also used in the Jackson Hole Study (Kaliszewski, 2011). It should also be noted that this direct spending may have taken place in Duluth anyways had these mountain bikers chose to spend their money in other ways. It should also be noted that this is the direct amount paid by locals for mountain biking related items.

Figure 6: Local Mountain Biker Spending

Expenditure	Total expenditures from those surveyed	Average spent per person
Bikes*	$36,491.00	$151.41
Bike Rental	$1,790.00	$7.43
Guide Service	$1,620.00	$6.72
Lift Ticket	$9,684.00	$40.18
Bike Accessories	$68,145.00	$282.76
Miscellaneous Bike Parts	$76,306.00	$316.62
Maintenance and Repairs	$38,490.00	$159.71
TOTAL	**$232,526.00**	
Total Spending per local person		**$964.84**
	Low	High
Population	11,250.00	15,000.00
Total Local Spending	**$10,854,429.46**	**$14,472,572.61**

*Based on the fact that the average person purchases a bicycle every 10 years, as noted in the Jackson Hole Economic Impact study, the total expenditures from those surveyed for bikes were divided by 10 to show this assumption (Kaliszewski, 2011).

The survey also asked locals about how long they have been living in Duluth. Of the locals surveyed 68, or 28%, responded that they have been living in Duluth for less than five years. These 68 riders were then asked an additional question about why they moved to Duluth and they were only allowed to provide one response. The most popular response was schooling followed by outdoor recreation. These results are summarized in Figure 7.



Nonlocal Results

135 nonlocals were surveyed. 11 of these people responded that they made zero trips to Duluth for the primary purpose of mountain biking, so for the purpose of this study they were removed from the data set as well as two other outliers. The population of nonlocal mountain bikers in Duluth was estimated to be 75% of the total mountain biking population providing a low population estimate of 33,750 and a high estimate of 45,000.

Respondents were asked if they typically come to Duluth for the day or if they stay overnight. This question was used to separate the nonlocal population into two categories, day visitors and multiday overnight visitors. Results showed that one-third of nonlocal mountain bikers take day trips to Duluth, while two-thirds stay overnight.

Assumptions

For the purpose of the analysis of the nonlocal results a few assumptions were made. First, respondents were asked their average expenditures related to transportation (gas), food, entertainment and lodging (for overnight visitors). It was assumed that these expenditures are usually purchased on a per-party basis and therefore hard to differentiate the per-person expenditure amount. Therefore the purpose of this study, respondent's answers for these three categories were divided by the average party size to get the results

on a per-person basis. 80% of nonlocals responded that they typically bike with 2 to 4 people, so the assumed per party expenditure totals were divided by 3 to get expenditures on a per person basis. This was a common assumption made in other economic impact of mountain biking studies such as the economic impact of mountain bicycle events in Oregon (McNamee, Jeff & Katie Main & Kadin Hashimato, 2013). Second, respondents were asked two questions about their average expenditures for food, how much they spent on groceries and liquor, and how much they spent at restaurants. The nonlocal day visitor totals for these two categories were identical. Therefore the assumption was made that trail users either spend money on one or the other, so for the purpose of the study the amount of money spent on groceries and liquor, and at restaurants were averaged to get the trail user spending on food.

Nonlocal Day Visitors

The 41 nonlocal day trip visitors surveyed took a total of 365 trips to Duluth for the primary purpose of mountain biking, for an average of 9 day trips a year. This was used to find the total yearly spending on day-to-day expenditures such as food and entertainment. The results were entered into IMPLAN on a per person per year basis. Figure 9 shows a summary of the nonlocal day visitors in comparison to the nonlocal overnight visitor per person yearly expenditures entered into IMPLAN. Results conclude that the average per person direct spending by nonlocal day visitors is $431.77 a year. One thing to note, as you can see in Figure 5, per person per year spending on entertainment for day visitors was almost twice the amount of those overnight visitors.

Nonlocal Overnight Visitors

The 81 nonlocal overnight visitors surveyed took a total of 441 trips to Duluth for the primary purpose of mountain biking, for an average of 5.1 trips per year. On average they stayed two days, so 10 days was used to find total yearly spending on day-to-day expenditures such as food, entertainment and lodging.

A weighted average was used to find per party per year spending on lodging. The most popular form of lodging was a hotel, at 37% of riders, while friends and family came in a close second at 35% of riders. For those riders who stayed with friends or family it was assumed that any expenditure amount they recorded was a gift, and left out of the economic impact study. The average total lodging per night for those riders surveyed was $64.72. This number was then multiplied by 10 (average number of nights nonlocal overnight riders stayed) and then divided by 3 (average party size) to arrive at per person per year spending on lodging of $215.72. The lodging results are summarized in Figure 8.

Figure 8: Nonlocal Lodging Results Summary

Type of Lodging	Hotel	Motel	RV	Family/ Friends	Camping		
Average spent per night	$147.16	$90.63	$42.50	$0	$28.67	Average Total lodging per night	**Total lodging per person per year**
% Of population using this lodging	36.52%	4.01%	1.65%	34.67%	23.15%		
Weighted average spending per night on lodging	$53.74	$3.63	$0.70	$0	$6.64	$64.72	**$215.72**

As mentioned earlier, Figure 9 shows a summary of the nonlocal day visitors in comparison to the nonlocal overnight visitor per person yearly expenditures entered into IMPLAN. Results conclude that the average per person direct spending by nonlocal overnight visitors is $803.80 a year.

Figure 9: IMPLAN Inputs
Per person per year nonlocal spending

Expenditure	Per person per year - Day Visitor	Per person per year - Overnight Visitor
Bike Purchase*	$11.89	$23.77
Bike Rental	$1.52	$3.03
Bike Repair / Maintenance	$15.71	$31.42
Lift ticket / trail fees	$14.19	$28.38
Miscellaneous bike equipment	$34.47	$68.93
Miscellaneous retail	$51.97	$103.93
Gas	$11.92	$23.83
Food	$175.24	$238.68
Entertainment	$114.88	$66.09
Lodging	N/A	$215.72
Total per person per year spending	**$431.79**	**$803.78**

*Based on the fact that the average person purchases a bicycle every 10 years, as noted in the Jackson Hole Economic Impact study, the average expenditure from those surveyed for bikes was divided by 10 to show this assumption (Kaliszewski, 2011).

Nonlocal IMPLAN Results

The average per person per year expenditures shown in Figure 5 were modeled separately for day visitors and overnight visitors. Two separate levels were used to make a low and high estimate. The results conclude that nonlocal mountain bikers contribute a total of $25.8 million to $34.4 million every year to the Duluth economy based on the total output results. See Figure 10 and Figure 11 for a summary of the results. The results are broken down between the direct, indirect and induced effects.

Through the use of IMPLAN the direct effects are reduced by any margins. Margins are the markups that create the difference between the price a consumer pays for an item and the value of that item at the factory door. For example, say a mountain biker purchases a $1,000 bike from a local bike shop; all of that $1,000 does not have a direct impact on the Duluth economy because you need to consider the markups. These markups will include things such as the wholesale price paid to the bike manufacturer, which would not have an impact on the Duluth economy (Day, n.d). This provides a more accurate estimate of the amount of trail user expenditures that are directly impacting the Duluth economy by taking out any amounts that are economically impacting other cities. The total output from indirect effects is $4.2 million to $5.6 million. As mentioned earlier this is the impact from the local industries that are directly impacted by mountain bikers buying goods from other local industries. The total impact from the induced effects is $5 to $6.7 million. As mentioned earlier this is the money that employees earn through the direct effects being re-circulated into the economy through spending by these employees.

The results of this research conclude that nonlocal mountain bikers add an additional 313.1 to 417.4 jobs to the local economy, for a labor income of $8.8 million to $11.7 million. However, it should be noted that these employment numbers include both full time and part time jobs. Because of the increase in employment, the top industries affected tend to be service industries.

One will also notice in Figure 7 and Figure 8 a column labeled value added and output. The value added is defined as “the difference between an industry’s or an establishment’s total output and the cost of its intermediate inputs” ("The controlled vocabulary of IMPLAN-specific terms", 2017). These intermediate inputs are the use of goods and services purchased from other industries. In comparison, output is the value of industry production. For the purpose of this study the end results are taken from the output results.

Figure 10: Total Nonlocal Economic Impact Low Population Estimate

Impact Type	Employment	Labor Income	Value Added	Output
Direct Effect	241.5	$5,840,654	$9,401,255	$16,559,515
Indirect Effect	32.2	$1,310,135	$2,025,054	$4,213,689
Induced Effect	39.4	$1,620,277	$2,788,384	$5,010,509
Total Effect	**313.1**	**$8,771,065**	**$14,214,693**	**$25,783,712**

*Low nonlocal population estimate was 33,750

Figure 11: Total Nonlocal Economic Impact High Population Estimate

Impact Type	Employment	Labor Income	Value Added	Output
Direct Effect	322.1	$7,787,538	$12,535,006	$22,079,353
Indirect Effect	42.9	$1,746,846	$2,700,072	$5,618,251
Induced Effect	52.5	$2,160,369	$3,717,846	$6,680,679
Total Effect	**417.4**	**$11,694,754**	**$18,952,924**	**$34,378,283**

*High nonlocal population estimate was 45,000

Total Economic Impact Results

Combing the local and nonlocal expenditure results conclude that the total economic impact of mountain bikers in Duluth is between $36.6 million and $48.9 million a year. These numbers include an additional $8.8 million to $11.7 million in labor income due to the creation of an additional 313.1 to 417.4 jobs because of nonlocal spending.

V. Conclusion

Through the use of a survey taken by 384 people, data analysis, and IMPLAN this study quantified the extent of economic impact and satisfaction levels of Duluth mountain bike trail users. First the demographics of trail users were analyzed to conclude that the majority of riders in Duluth are male with annual income levels that varied greatly across respondents. 57% of survey respondents were between the ages of 30 and 49, and 57% ride the Duluth mountain bike trails at least once per week. Overall, Duluth mountain bike trail users are satisfied with the various aspects of the trails such as the variety of trails, bike friendly amenities, number of trails, etc.

Results of this study show that mountain bikers in Duluth who ride these trails contribute $36.6 million to $48.9 million a year to the Duluth economy. This number includes an economic impact of $10.9 million to $14.5 million from local trail users and an economic impact of $25.8 million to $34.4 million from nonlocal trail users. One can see that the original estimated cost of $6.1 million to $7 million, to add an additional 70 miles to the Duluth Mountain biking trail system, is economically beneficial to the Duluth economy. The original investment is creating annual returns greater than the original costs.

VI. Areas for Further Study

After analyzing the surveys and figuring out the economic impact of mountain biking in Duluth, there is still plenty of room for further study. This report provides an estimate for the total economic impact based on expenditures using the survey results and an estimated range of the total trail user population. This estimate could be made stronger with trail counts at the various mountain bike trailheads in Duluth. Trail counts would provide more accurate estimation of the total population of mountain bike trail users in Duluth.

Additionally, due to the time limitation of this study surveys were distributed between the months of January and March using social media and emails. Not all trail users might be on social media or email. Therefore, to strengthen results additional surveys could be passed out at trailheads and on trails during the summer months.

Other research could be conducted in the future to study the economic impacts of mountain biking in other ways besides the economic impact through expenditures. Another valuable method that could be used is the hedonic pricing method. This method can be used to estimate economic benefits and/or costs of residential properties associated with their proximity to a recreational site. The hedonic pricing method can be used to value the Duluth mountain bike trails and determine how property values may differ depending on one's proximity to these trails ("Hedonic Pricing Method", n.d.).

VII. Acknowledgments

I would like to thank my faculty advisor, Christopher McIntosh associate professor at the University of Minnesota Duluth, for his advice and support during this research project. I would also like to express my gratitude to Monica Haynes, director at the Bureau of Business and Economics Research for her expertise and guidance using IMPLAN. This research project was made possible through funding from the Undergraduate Research Opportunities Program (UROP). Additional special thank you to my friends and family who supported me throughout the entire research process, and the UMD University Honors program for encouraging me to complete a capstone project. Finally, this project would have been impossible without the help of all of the Duluth mountain bikers who took the survey.

VIII. Works Cited

Boozer, Benjamin & Mike Self. (2012). *An Economic and Impact Analysis of the Coldwater Mountain Bike Trails*.

Consumer Surplus. (2017). *Investopedia*. Retrieved 26 February 2017, from http://www.investopedia.com/terms/c/consumer_surplus.asp

Day, F. *Principles of impact analysis & IMPLAN applications* (1st ed.)

Duluth Traverse Mini Master Plan. (2017). Retrieved on March 26, 2017 from http://www.duluthmn.gov/parks/

Fix, Peter & Loomis, John. (1997). *The Economic Benefits of Mountain Biking at One of Its Meccas: An Application of the Travel Cost Method to Mountain Biking in Moab, Utah*. Journal of Leisure Research, 29, 342-352. Retrieved from EbscoHost February 5, 2017.

Hedonic Pricing Method. *Ecosystemvaluation.org*. Retrieved 11 March 2017, from http://www.ecosystemvaluation.org/hedonic_pricing.htm

Helal, Liala. (2014). *Duluth voted Outside magazine's best outdoor town*. Minnesota, Minnesota Public Radio. Retrieved on Jan 21, 2017 from http://blogs.mprnews.org/statewide/2014/06/duluth-voted-outside-magazines-best-outdoors-town/

IMPLAN Methodology | Research on the Economic Impact of Cooperatives. *Reic.uwcc.wisc.edu*. Retrieved 9 March 2017, from http://reic.uwcc.wisc.edu/implan/

Kaliszewski, Nadia. (2011). *Jackson Hole Trails Project Economic Impact Study*.

Kraker, Dan. (2014). "Duluth Can See the Finish Line for New Mountain Bike Trail." *Minnesota Public News Radio News*. Web. 05 Oct. 2016.

Lau, Lee. (2014). *Economic Impacts of Mountain Biking Tourism. Pinkbike.com*. Retrieved from Pink Bike, February 14, 2017. https://www.pinkbike.com/news/economic- impacts-of-mountain-biking-tourism-2014.html

McNamee, Jeff & Katie Main & Kadin Hashimato. (2013). *Project Brief: The Economic Impact of Mountain Bicycle Events in Oregon.* http://www.leelau.net/Misc/EIS%20bike/mcnamee_mtb_report%20Oregon%20 2012.pdf

Oakridge (OR) Gold-level | International Mountain Bicycling Association. *Imba.com*. Retrieved 26 March 2017, from https://www.imba.com/ride-centers/current/oakridge-or

Passi, P. (2015). *Duluth to carve tourism tax pie*. *Duluthnewstribune.com*. Retrieved 11 April 2017, from http://www.duluthnewstribune.com/news/3886807-duluth-carve-tourism-tax-pie

The controlled vocabulary of IMPLAN-specific terms. (2015). Retrieved 16 April 2017, from http://support.implan.com/index.php?option=com_glossary&task=list&letter=V&Itemid=1866

U.S. Data Methods and Sources. (2015). Retrieved 16 April 2017, from http://support.implan.com/index.php?option=com_content&view=article&id=414:414&catid=163:knowledge-base

Western Canada Mountain Bike Tourism Association. (2007). *Sea to Sky Mountain Biking Economic Impact Study*. Retrieved 10 March 2017, from https://headwaterseconomics.org/trail/89-sea-to-sky-mountain-biking-impact/

2014 Cuyuna Cyclist Survey. *Imba.com*. Retrieved 26 March 2017, from https://www.imba.com/resources/2014-cuyuna-cyclist-survey

2014 WMBC Rider Survey. Retrieved from Pink Bike http://www.pinkbike.com/u/leelau/blog/economic-impacts-of-mountain-biking-tourism.html

Appendix

Copy of Qualtrics Survey

Duluth Mountain Bike Trail User Survey - University of MN, Duluth

Q1 We ask that before you begin this survey you read all of the details below. You are invited to be in a research study on The Economic Impact of Mountain Biking in Duluth. To take this survey you must have mountain biked in Duluth, MN before.
This study is being conducted by: Abby Savolt, Economics Department at the University of Minnesota Duluth.
If you agree to be in this study, we would ask you to do the following things: Answer each survey questions honestly and to the best of your ability. The records of this study will be kept private. In any sort of report we might publish, we will not include any information that will make it possible to identify a subject. Research records will be stored securely and only researchers will have access to the records.
Voluntary Nature of the Study:
Participation in this study is voluntary, however you must be 18 or older to participate. Your decision whether or not to participate will not affect your current or future relations with the University of Minnesota Duluth. If you decide to participate, you are free to not answer any question or withdraw at any time without affecting those relationships.
Contacts and Questions:
The researchers conducting this study are: Abby Savolt and Christopher McIntosh. If you have questions you are encouraged to contact them at Abby Savolt, 920-246-4920, or savol013@d.umn.edu. Or Christopher McIntosh at 218-726-840, and cmcintos@d.umn.edu. If you have any questions or concerns regarding this study and would like to talk to someone other than the researcher(s), you are encouraged to contact the Research Subjects' Advocate Line, D528 Mayo, 420 Delaware St. Southeast, Minneapolis, Minnesota 55455; (612) 625-1650. After reading the above, are you willing to participate in this survey.

- ❍ Yes, I can confirm that I have read the above, I have mountain biked in Duluth before, and I am willing to participate
- ❍ No, I no longer wish to participate at this time

Q2 What is your age?

- ❍ Under 18
- ❍ 18-22
- ❍ 23-29
- ❍ 30-39
- ❍ 40-49
- ❍ 50-59
- ❍ 60+

Q3 What is the zip code of your home address?

Q4 What is your gender

- Male
- Female
- Prefer not to say

Q5 What is your household income before taxes?

- a. Under $24,999
- b. $25,00-49,999
- $50,000 – $74,999
- $75,000 - $99,999
- $100,000 - $124,9999
- $125,000 – $149,999
- More than $150,000

Q6 Including yourself, how many people do you ride with on average?

- 2-4
- 4-6
- >6

Q7 Which do you prefer:

- Winter biking
- Summer biking
- Year round biking

Q8 How often do you ride the mountain bike trails in Duluth during your preferred season?

- ❍ Once per year
- ❍ Once per month
- ❍ Twice per month
- ❍ Once every two weeks
- ❍ Once per week
- ❍ Twice per week
- ❍ Three times per week
- ❍ Four times per week
- ❍ Five times per week
- ❍ Six times per week
- ❍ Seven times per week
- ❍ More than seven times per week

Q9 Do you own the bike you are riding?

- ❍ Personal bike
- ❍ Rental bike
- ❍ Borrowed friend/family bike

Q10 How do you typically access the trails?

- ❍ Car
- ❍ Bike
- ❍ Bus
- ❍ Walk

Q11 On average, what is the distance you travel to access the trailheads?

- ❍
- ❍ 1-5 miles
- ❍ 6-10 miles
- ❍ 11-25 miles
- ❍ 26-50 miles
- ❍ 51-75 miles
- ❍ 76-100 miles
- ❍ >100 miles

Q12 Rate your satisfaction with Duluth Mountain biking

	Very Satisfied	Somewhat Satisfied	Neutral	Somewhat Dissatisfied	Very Dissatisfied
Variety of trails	❍	❍	❍	❍	❍
Bike friendly amenities	❍	❍	❍	❍	❍
Trail accessibility	❍	❍	❍	❍	❍
Number of trails	❍	❍	❍	❍	❍
Signage and maps on trails	❍	❍	❍	❍	❍

LOCAL PORTION OF THE SURVEY

Q13 Do you receive emails from COGGS (Cyclist of Gitchee Gumee Shores)?

❍ Yes

❍ No

Q14 What are your approximate equipment expenditures related to mountain biking made in Duluth in the last year? Give answer in dollars. If zero, enter 0.

Bike Purchase

Bike Rental

Guide Service / Lesson

Lift ticket (Spirit Mountain)

Bike accessories/ apparel

Miscellaneous bike parts

Maintenance / repairs

Q15 How long have you been living in Duluth?

❍ 0-5 years

❍ 5-10 years

❍ 10-20 years

❍ 20-30 years

❍ >30 years

Q16 If less than 5 years, what brought you to Duluth?

- ❍ Job opportunity
- ❍ Schooling
- ❍ Quality of life
- ❍ Outdoor Recreation
- ❍ Other _____

NONLOACL PORTION OF THE SURVEY

Q17 What is usually your primary purpose for visiting Duluth?

- ❍ Vacation
- ❍ Business
- ❍ Camping
- ❍ Visiting Friends
- ❍ Biking
- ❍ Other _____

Q18 How many trips have you made to Duluth in the last year for the primary purpose of biking?

Q19 On average, do you usually come to Duluth just for the day? Or do you stay overnight?

- ❍ Day trip
- ❍ Overnight

Q20 On average, what is the average number of nights spent in Duluth per over-night trip?

Q21 What type of lodging do you use when in Duluth and what is the cost per night? Give answer in dollars. If zero, enter zero.

Hotel
Motel
RV
Family / Friends
Camping

Q22 What were your average trip expenditures made in Duluth in the last year? Give answer in dollars. If zero, enter zero

Bike Purchase
Bike Rental
Guide Service / Lesson
Bike Repair / Maintenance
Lift ticket (Spirit Mountain)
Miscellaneous bike equipment
Miscellaneous retail
Gas

Q23 What were your average trip expenditures made in Duluth on a day-to-day basis this year? Give answer in dollars. If zero, enter zero.

Groceries / Liquor
Restaurants / Bars
Entertainment

Q24 How did you hear about the mountain biking trails in Duluth?

- ❍ Magazine
- ❍ Friend / family member
- ❍ Social media
- ❍ Talking to people while in Duluth
- ❍ Other _____

Q25 How likely are you to return to Duluth to mountain bike?

- ❍ Very unlikely
- ❍ Somewhat unlikely
- ❍ Neutral
- ❍ Somewhat likely
- ❍ Very likely